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Fructification of *Collybia cirrata* on mummified gleba of *Bovista dermoxantha* in Hokkaido, Northern Japan

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Abstract — Fructification of *Collybia cirrata* on mummified gleba of *Bovista dermoxantha* is newly recorded from Daisetsuzan volcanic group, Hokkaido, Northern Japan. Also, it is the first report of *C. cirrata* in Japan. Macro- and microscopic characteristics and unusual habitat of this fungus are described and illustrated based on Japanese specimens.

Key words — gasteromycetes, host fungus, *Lycoperdaceae, Tricholomataceae*

Introduction

Collybia (Fr.) Staude sensu Antonín & Noordeloos (1997) comprises four species, *C. tuberosa* (Bull.) P. Kumm., *C. cirrata*, *C. cookei* (Bres.) J.D. Arnold and *C. racemosa* (Pers.) Quél. These are small, grayish to whitish agaricoid mushrooms that share a unique habitat, fruiting on the remains of dead fleshy mushrooms (Hughes & Petersen 2006). Hughes et al. (2001), however, separated *C. racemosa* from the rest based on a molecular study and described the new genus *Dendrocollybia* for it with *D. racemosa* (Pers.) R.H. Petersen & Redhead as sole species. Therefore, now only three species remain in *Collybia* sensu stricto.

During our floristic investigation of subarctic and subalpine to alpine zones of Daisetsuzan volcanic group, Hokkaido, Northern Japan, we collected an unusual small agaric that was associated with the mummified gleba of dead lycoperdaceous fungus. According to our morphological observations, we identified this agaric as *C. cirrata* and recognized the host fungus as *Bovista dermoxantha* (Vittad.) De Toni. Hitherto, several species of *Lactarius* Pers.,

Russula Pers. and a polypore, *Meripilus giganteus* (Pers.) P. Karst. have been identified as the host mushrooms of *C. cirrata* (Noordeloos 1995, Hughes & Petersen 2006), but until now, no gasteromycetes have been recorded as the host of *C. cirrata*. Furthermore, since only *Collybia tuberosa* and *C. cookei* have previously been known from Japan (Ito 1959), our collections also represent the first record of *C. cirrata* from Japanese mycobiota.

Materials and methods

The specimens examined in this study are deposited in the mycological herbarium of National Museum of Nature and Science, Tsukuba, Japan (TNS). Macroscopic characters were described by observations on dried or fresh materials. For light microscopic observations, free-hand sections of dried or fresh specimens were mounted in water, Melzer's reagent, 3% (w/v) KOH and 30% ethanol solution on glass slides. More than forty randomly selected basidiospores were measured under a light microscope at 1000× magnification. The surface features of basidiospores and capillitia of the host fungus were also observed by scanning electron microscopy (SEM). For SEM, small portion from the gleba were dusted onto double-sided adhesive tape on a specimen holder and coated with platinum-palladium using an E-1030 Ion Sputter Coater (Hitachi, Tokyo, Japan). They were examined with a S-4200 SEM (Hitachi, Tokyo, Japan) operating at 20 kV.

Taxonomy

Collybia cirrata (Schumach.) Quél.,
Mém. Soc. Émul. Montbéliard, Sér. 2, 5: 96 (1872), as "*cirrhatus*". Figures 1–2
≡ *Microcollybia cirrata* (Schumach.) Lennox, Mycotaxon 9: 193 (1979), as "*cirrhata*".
= *Collybia amanitae* (Batsch) Kreisel, Pilzfl. DDR, Basidiomyc.: 47 (1987), as "ined.", nom. inval. (Art. 34.1 (a)).

Pileus 1.5–8 mm diam., convex then plano-convex with slightly depressed center, finally irregularly concave, with almost straight margin, slightly hygrophanous, when moist white, cream to pale gray with slightly darker center, pallescent when drying, shining or dull, at margin sometimes slightly radially grooved, smooth, glabrous. Lamellae crowded, adnate, often slightly decurrent, white to cream, thin, with concolorous entire edge, 12–20 lamellae reaching stipe apex, 3–5 tiers of lamellulae. Stipe 10–15 × 1–1.5 mm, cylindrical or compressed, at apex white or pallid, downwards pale gray, yellowish brown or sometimes reddish brown, entirely pruinose or in upper part only and glabrous below, at base with radiating, white mycelial strands attached to the substratum, without forming a sclerotium. Context very thin, white. Smell indistinct. Spore print white.

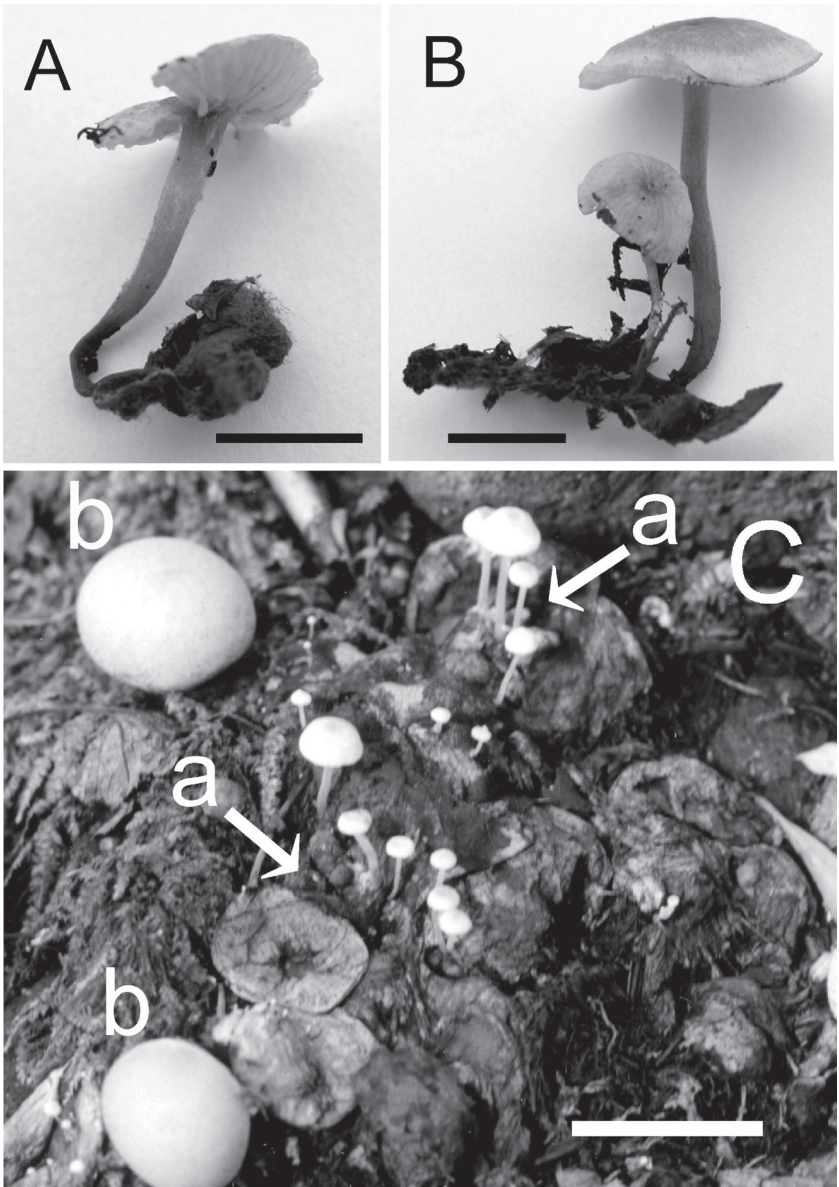

Fig. 1. *Collybia cirrata* (from TNS-F-18606): A–B: Basidiomata associated with the mummified gleba of *B. dermoxantha*, C: *C. cirrata* in the natural habitat, a: basidiomata grows on the mummified gleba of *B. dermoxantha* (arrows), b: mature basidiomata of *B. dermoxantha*.

Bars: A–B = 5 mm; C = 10 mm.

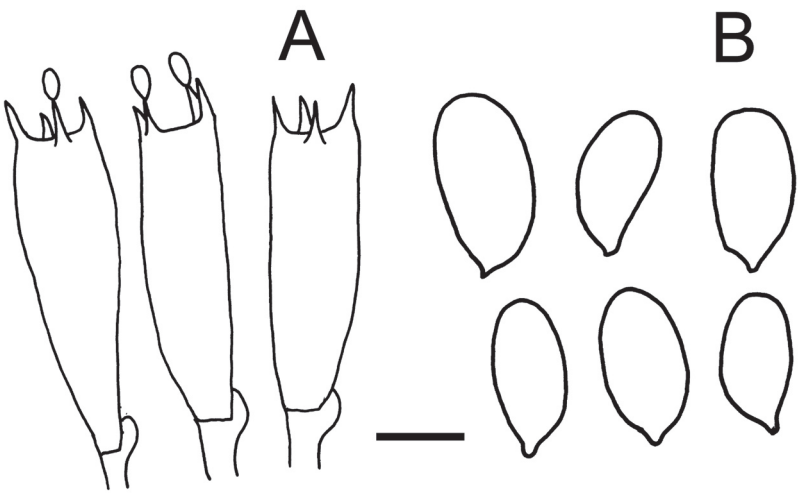

Fig. 2. *Collybia cirrata* (from TNS-F-18609): A: Basidia, B: basidiospores. Bars: A = 5 μm; B = 2.5 μm.

Basidiospores 4.3–5.3 × 2.3–3 μm, Q = 1.3–2.1, ellipsoid to cylindrical, smooth, hyaline, thin-walled, nonamyloid. Basidia 15–22.5 ×3.5–5.5 μm, 4-spored, clavate. Lamella edge fertile. Hymenophoral trama subparallel, made up of 4–7.5 μm wide, cylindrical, thin-walled, hyaline hyphae. Pileipellis an ixocutis of cylindrical, 5–6.5 μm wide hyphae, with hyaline or pale yellowish walls, thin-walled, embedded in a 15–30 μm thick gelatinous hyaline matrix, with scattered erect, cylindrical, cystidioid terminal elements, 6–40 × 2–5.5 μm with thin, hyaline walls. Stipitipellis a cutis of 2–6 μm wide, cylindrical, pale yellow to yellowish brown hyphae. Caulocystidia 8–30 × 2–4.5 μm, cylindrical with rounded apex and curled base, towards base of stipe often up to 120 μm long, septate. Clamp-connections abundant in all tissues.

Habitat — Gregarious on the mummified gleba of *B. dermoxantha* in the open forest dominated by *Alnus crispa* subsp. *maximowiczii* (Callier) Hultén, *Betula ermanii* Cham. and *Salix bakko* Kimura of the subalpine and subarctic mountainous region.

Distribution — Japan (new record), Northern Eurasia (Hughes & Petersen 2006), Europe (Noordeloos 1995) and North America (Lennox 1979).

Japanese name — Hokori-yagura-take (newly named).

Specimens examined — **JAPAN. Hokkaido,** Kamikawa Province, Kamikawa-cho, Daisetuzan volcanic group, Ginsendai, alt. on 1535 m, 25 September 2006, S. Sato (TNS-F-18606); same locality, 18 September 2007, S. Sato (TNS-F-18609).

Discussion

The size of the basidiospores of the Japanese specimens deviate slightly from those reported for Europe (4.5–7 × 3–3.5 μm, Noordeloos 1995) and North America (5–7.5 × 2.5–3.5 μm, Lennox 1979). However, all other morphological characteristics of the Japanese specimens agree fully with previous descriptions of *Collybia cirrata* (Lennox 1979, Noordeloos 1995, Antonín & Noordeloos 1997). The presence of a sclerotium clearly distinguishes the other two species of the genus — *C. tuberosa* and *C. cookei* — from *C. cirrata* (Noordeloos 1995, Antonín & Noordeloos 1997, Hughes et al. 2001, Hughes & Petersen 2006).

We identified the host fungus of Japanese specimens as *Bovista dermoxantha,* which is a common representative of the *Lycoperdaceae* in Japan (Kasuya 2004a, b), based on morphological observations of capillitia and basidiospores (Fig. 3). This is the first report of fructification of *C. cirrata* on mummified gleba of lycoperdaceous fungi.

Collybia cirrata has frequently been collected from temperate, boreal, and alpine/arctic habitats of Europe, northern Eurasia and North America (Hughes & Petersen 2006). The Japanese specimens were also collected from subalpine and subarctic, open deciduous forests in northern Japan. We therefore infer a circumboreal distribution for *C. cirrata,* but further investigations of similar habitats in Asia are needed to clarify the geographical distribution of this fungus.

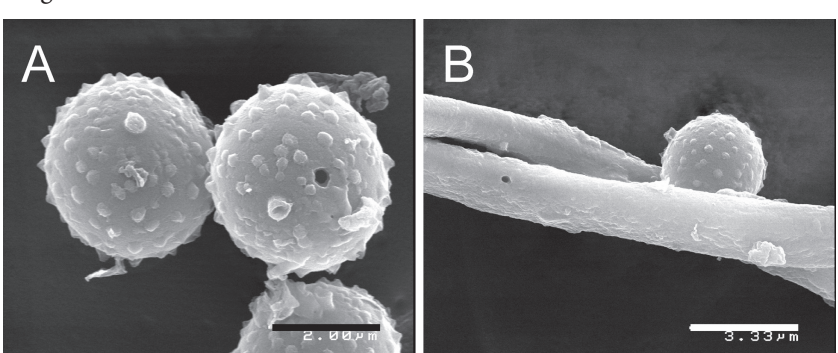

Fig. 3. *Bovista dermoxantha*, a host fungus of *C. cirrata* (from TNS-F-18606). SEM images. A: Basidiospores, B: Capillitia and a basidiospore. Bars: A = 2 μm; B = 3.33 μm.

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